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Science and Art Gossip.

We regret that in a Gossip paragraph which appeared a few weeks ago, Dr. Collyns Simon's name was spelled, by mistake, Dr. Collins Symon. The *Oxford Chronicle and Bucks and Berks Gazette* regards this as evidence that we are "smarting under discomfiture," and so forth; but it was purely accidental. We had not a book, pamphlet, letter, or even card of Dr. Simon's to remind us how his name is spelled. Beyond noting that we did not "quarrel with," but accepted, Dr. Thos. Young's illustration of the absorptive action of our air on light, we have nothing further to say about Dr. Simon's theory. Not for the fifty pounds he offers, nor for five thousand, would we undertake to convince him it is preposterous.

We supposed a letter sent us came from Dr. Simon. He says (for it is manifest that it is he who writes in the *O. C. and B. and B. G.*) he did not write it; and of course we accept his statement. He must permit us to assure him in turn that he is wholly mistaken in attributing to our pen a letter signed "An Admirer of Knowledge," which appeared in Knowledge for Dec. 10, 1881. We do not know who wrote it; but it bore the Oxford post-mark. We wish we had consigned it to the waste-paper basket.

Among opinions which he regards as paradoxical (naturally enough), Dr. Simon attributes to us this: that "the weight of bodies is something different from the earth's attraction." If Dr. Simon will look at any elementary treatise on Mechanics, he will find that the quality called weight is an effect of the earth's attraction; and philosophy is so fanciful as to draw a distinction between cause and effect. The other "paradoxes" relate to Dr. Simon's peculiar theory, and we forbear to irritate him by dealing further with that theory.

In response to many requests, we propose to publish in Knowledge of May 4, the passage (nominally Richter, but, in reality, rather De Quincey's) which formed the closing quotation of the first and last lectures at St. James's Hall.

Compositors are sometimes a little hard on jests, sentiment, and science. We have all heard how the touching line, "He kissed her under the silent stars," was altered by a cruel compositor into "He kicked her under the cellar stairs"; and I think I have already mentioned in these columns how the words "Lines, bands, and striæ near the violet end of spectra," were altered into "Links, bonds, and stripes for the violent kind of spectres." Now, I have to lament the destruction of a very mild joke, meant at once to instruct and to amuse "A Little Girl"—see "Letters Received," page 240. She had spelled *experience* "experiance," and—well, the rest is not worth repeating; but by carefully correcting the spelling, notwithstanding an entreaty in the margin that he would leave it alone, a hard-hearted compositor knocked the point off *that* little joke, anyhow!

Mr. Browning has recently sent to the Royal Observatory at Rome a set of apparatus which he has made for Professor Tucchini, consisting of a very powerful direct vision spectroscope fitted to a photographic camera. The apparatus is intended to be used for the purpose of photographing the spectra of the flames which issue from Vesuvius when in a state of eruption. The scale of the spectroscope for reading off the position of the lines in any spectrum is illuminated by means of a small incandescent electric lamp.

The Comet.—Mr. A. B. Biggs supplies the following interesting notes:—On Monday evening at ten o'clock I perceived a minute star (9th magnitude) in the advancing edge of the comet's coma, which I foresaw would be crossed centrally by the nucleus—a rare opportunity which I determined not to miss. At eleven o'clock the star was fairly in the centre of the nucleus. The nucleus was *perfectly transparent*. I watched the star until it had well crossed, and never lost sight of it, even when a slight atmospheric haze obscured the comet itself. The light of the star was not even sensibly diminished, except so far as being seen upon the light background of the comet.—*Launceston (Tasmania) Examiner.*

An Improved Bell Telephone.—M. D'Arsonval, the well-known telephonist, has devised a new form of Bell receiver, which is, for its size and weight, the most powerful yet constructed. The chief modification consists in enclosing the bobbin entirely between the poles of the magnet. This is done by making one pole of the magnet the core of the bobbin, and the other pole an enclosing ring of iron. The inductive plate vibrates over the poles and upper surface of the coil as before. The complete instrument only weighs a little over five ounces, and is stated to be as powerful as the heavy Gower-Bell receiver. M. Leczensky has applied magnets of steel, tempered by compression after the manner introduced by M. Clemandot, and since this mode of tempering does not deform the magnets, a neater article is the result.—*Engineering.*

The *Nautical Gazette* (New York, March 22), referring to the triple-hulled steamer designed by Captain William Coppin, expresses a very favourable opinion of its value; and this seems to be shared by a number of American naval officers. The feature which they consider of chief importance is the high speed at which it is said that a vessel of this type may be propelled; and the writer remarks that, if it is adopted, there is no question but that the ocean can be crossed in 120 hours.

XUM

Although three months will pass before the Engineering and Metal Trades Exhibition will be held, the preparations for it are very advanced, and the principal difficulty of the promoter, Mr. Samson Barnett, will probably be that of finding sufficient space for exhibitors within the narrow limits of the Agricultural Hall, as already over 200 applications for space have been accepted. At present the space has been let almost exclusively to manufacturers in the United Kingdom, but it is expected that a fair number of Continental industries will be represented.

The *Industrie Blatter* recommends the following formula as furnishing a good and cheap writing ink:—French extract of campeachy wood 100 parts, lime water 800 parts, phenol (carbolic acid) 3 parts, hydrochloric acid 25 parts, gum arabic 30 parts, red chromate of potash 3 parts. The extract is first dissolved in the lime water on a steam bath with frequent stirring or shaking, after which the carbolic and hydrochloric acids are added, and change the red colour to a brownish yellow. It is then heated half an hour on steam bath and set aside to cool. It is next filtered, and the gum and bichromate, dissolved in water, are added. Enough water is then added to make up the solution to 1,800 parts. This ink is a fine red when used, but soon gets black.

By permission of Messrs. Chapman & Hall, a shorthand edition (Pitman's system, easy reporting style) of the "Pickwick Papers" is to be published, in weekly parts of 24 pp., crown 8vo, in cover, price 3d., to be completed in twenty parts. The first part will be published May 1. This will give many an opportunity of studying the system easily and pleasantly.

The Cambridge University Press is about to publish the second part of the first volume of the "Treatise on Natural Philosophy," by Sir W. Thomson and Professor Tait. Many will hear with regret that the original design of the authors, in commencing this volume about twenty years ago, is not to be carried out beyond the completion of the first volume. The most important part of the labour of editing this second part has been borne by Professor Darwin. An index has been prepared by Mr. Burnside, and schedules of the alterations from the first edition and of new matter introduced into both parts will be added.

It is also announced that the University Press will publish presently the volume completing Mr. C. A. M. Fennell's edition of Pindar's Remains, "Notes on Qualitative Analysis," and "Tables," by Mr. H. J. H. Fenton (Demonstrator of Chemistry in the University), and a new edition of Mr. Wallace's "Outlines of the Philosophy of Aristotle."

"Forestry."—With the commencement, in May, of its next volume, *The Journal of Forestry*, still conducted by Mr. F. G. Heath, "Author of "Autumnal Leaves" and Editor of Gilpin's "Forest Scenery," will take a "new departure." Under the altered title of *Forestry: a Magazine for the Country*, it will be enlarged in size and still further popularised. The May part will include a descriptive article by Mr. Richard Jefferies, entitled "The Contents of Ten Acres," and "A Forgotten President of Agriculture," by Mr. R. A. Kinglake.

In answer to a number of inquirers, I must explain that I know nothing, of my own knowledge, about any system of artificial memory.

SOCIAL DYNAMITE.

By Richard A. Proctor.

If we consider why men look with special horror at the miscreants who use dynamite and nitro-glycerine with the hope of destroying their enemies, we see that it is not the cowardice, or even the malignity, of the act which chiefly excites that feeling, but the recklessness with which to destroy certain persons they run the risk, or rather incur the certainty, of injuring many who are not among their enemies. Among social offences there is one which in this respect is akin to the use of explosives—writing anonymous letters. An anonymous letter of the libellous sort is an explosive which may or may not injure the person or persons attacked, but is tolerably sure to injure others. It may denounce one or several in such a way as to lead those to whom it is addressed to imagine that there may be some truth in the attack—villanous though the source may be from which it came. These, of course, are the objects of the anonymous writer—to give pain to those attacked, and to cause doubt and suspicion to their friends and relatives. He may fail in this, because many have sense enough to consider that no reliance whatever can be placed on the statements of one who is ashamed to be known, and they may have confidence also (though this is harder) that none of their friends can for a moment put faith in statements emanating from a self-proclaimed, though unknown, rascal. But there is one form of mischief, one kind of doubt, which an anonymous letter is *sure* to produce. The person or persons attacked may despise, as they should, an attack so base; the persons before whom the anonymous charges are brought may, as they should, reject them as utterly unworthy of credit, coming as they do from a discreditable source. But though they may not be troubled by the belief that the particular offences brought before them by an admitted liar have in them any shadow of truth, they and all who hear of the anonymous charges become certain that there is villany somewhere. And who shall say *where?* Usually, an anonymous letter-writer is so clever in disguise, that it has been well and truly said, the author of an anonymous letter may generally be taken to be the *last* person who is likely to be suspected. But what a range of doubt and suspicion this idea covers. All whom we look on as likely to be truthful and generous, brave and outspoken; all who might be supposed to respect themselves; all who are worthy, as we think, of any respect from others, are included among those whom we should consider the last to plan the villany of an anonymous letter. Those whom we should suspect naturally are those whom we supposed to be sly and treacherous; but usually it turns out that the real traitor is one who has a depth of slyness and treachery beyond the range of this suspicion—one who has been clever enough to hide slyness and treachery by superior craft and deeper villany.

And as in dynamite plots there is an element of danger in attempts which may be made to unravel the secret—danger in which the miscreant author of the plot finds safety—so it is with anonymous letters. To trace the letter to its source may require—in fact usually does require—that its contents—or at least the nature of the attack in it—should be publicly announced. This brings the anonymous charges to the knowledge of many who may not, like his immediate friends, know enough of the true character of the person attacked to reject at once false charges against his reputation. The wicked and mischievous proverb, "There is no smoke without fire"—as lying a proverb as ever deceived the unwise—is held by many to be a truth, as if it had not again and again been shown

that in every community there exist persons capable of inventing absolutely baseless charges. So that many are ready to pass over in silence anonymous attacks against themselves or their friends, rather than suffer in character during attempts which may fail to detect the scoundrel who is in their midst, but as yet unknown to them.

It were well if all men had the courage to despise this risk. It should be regarded as so sacred a duty to expose miscreants of the kind we are dealing with, that all question of personal feeling should be set on one side. And, after all, very little real harm can be done even by the widest possible publication of anonymous charges, for only very foolish persons can possibly attach the least weight to them. Besides (though this is not a very lofty consideration), they spread widely enough even when men are most careful to keep them close, and it is better they should be published by those attacked, than secretly spread by those who originated them. Very often the only chance of detecting the hidden villain is by making his charges so widely public that some will hear of them who may have means of knowing whence they sprang.

These considerations have been partly suggested to my mind by the recent receipt of an anonymous post-card, of an abusive kind, which I received through the publisher of Knowledge, to whom it had been sent, marked in such a way as to attract, and even force, attention. The writing of even signed abuse on a post-card is an offence of the dynamitic type, because no one can tell by whom such a card may be seen, or who may be hurt by it. But even in these depths there is a deeper still, and worse than the ordinary anonymous letter-writer, villain though *he* is—worse than one who signs his name to post-card abuse, ruffian though *he* must be—is the creature who issues anonymous abuse on post-cards for all to read through whose hands the card must pass.

The case in point illustrates the *certain* evil which every anonymous letter must produce. Though at first I had no doubt that the communication came from the one person who ought to have known about the matter (sixteen months old) chiefly touched on by the writer, I think it now quite likely that I may have been mistaken. I do not *know*, may be I shall never know; and I am not very greatly concerned to correct the mistake, if such there be, till I do know; for undoubtedly the rascality of the post-card writer would have been impossible but for mistaken and self-injuring suspicion on the part of the only person who could have given him his information, true up to a certain point, and beyond that based entirely on an unworthy suspicion. But, putting this person on one side, the range over which my doubts might extend is wide enough. To *any* acquaintance of his who chanced to have some grudge against me (and no one who has been as much before the public as I have for the last fifteen years or so can be without enemies, if he is honest) the suspicion might attach, that he had been guilty of one of the most contemptible of the petty villanies of social life. Yet there are some clues by which Mr. Lockyer, who is the person chiefly concerned, may, if he please, help to detect the wrong-doer. He may rest assured that, if he is really anxious to sift this matter to the bottom, I will help him—publicly, not privately—to the utmost of my power. He knows, and I do not, to whom he has confided recently (it must be recently, for no one would keep such a matter many days in his mind) the terrible fact that nearly seventeen months ago I replied, under "Answers to Correspondents," to a letter addressed to me as Editor of Knowledge (in which character I had addressed him) about a paper which I had invited him to write. He knows who, among his friends, would rejoice in imagining that this might be a means of annoying, and even injuring, me. He may be able to guess who, among his friends, is capable of writing an abusive, unsigned note on a postcard, sent to a public office. I think I can supply such additional information as may perchance enable him to select among those who answer this description (and surely he cannot know many such scoundrels) the particular scoundrel who did this thing. If evidence from writing will be of any use—and even a print hand may reveal the writer—I will publish a facsimile (by photographic means) of enough of the letter to indicate its character and to serve this purpose. I may do this in any case, as I have thought it my duty, in any case, to indicate my recent doubts as to the authorship of the communication.

The matter is utterly trifling, and beneath notice as regards myself; but as the detection of even the paltriest of the villains who attempt to do mischief by explosives is important, even when they have done no harm, and are really powerless to do any, so I hold it to be of great importance that those in our midst who are ready to tamper with social dynamite should be detected and exposed. As I am earnest in wishing this, and Mr. Lockyer has abundant reason for desiring it, I have little doubt that, should he, being innocent, assist to the utmost of his power, we shall succeed in unearthing the real wrongdoers.

PLEASANT HOURS WITH THE MICROSCOPE.

By Henry J. Slack, F.G.S., F.R.M.S.

THE aphides found in swarms at this time of the year in greenhouses will be viviparous females, as mentioned in the last paper. Females of this description produce numbers of young, by an internal process which has been likened to the budding of plants, and they may, perhaps, be well compared with the infant bulbils produced so freely in that well-known garden flower, *lilium bulbiferum*. Females which lay eggs are distinct from the viviparous sort, and Mr. Buckton states that in the aphis tribe the former are always wingless, though winged in some other groups. The viviparous females, at certain times, give birth to young ones (*pupæ*), which develop wings to assist their migration, but they are not strong fliers, and drift easily with the wind. The appearance of males is rare in some species, and in all, the great swarms result from the action of the viviparous females. In many cases, the egg-laying must conduce to the maintenance of the species, as the eggs require no external supply of food, but the insect, as well as the egg, can withstand a considerable amount of winter cold.

If the reader has caught and watched some aphides, as advised in the last paper, their rapid multiplication will be understood. Various calculations have been made as to the astounding quantities and the prodigious bulk and weight that would be attained if no check occurred to lessen the fertility. "A Mathematical Friend" cited by Mr. Buckton improved upon Professor Huxley's calculation; and, on the supposition that one aphis would produce twenty young ones in as many days, and each one of these would begin, when five days old, to rear a family of the same size, and so on in succession, found that at the end of three hundred days the descendants of the original ancestress would amount "to the fifteenth power of 210, which it is almost impossible to express in figures. There would be room for nothing else in the world but aphides." Similar calculations might be made with reference to many

other prolific creatures, from vertebrates to insects, and objects still lower. There are two things to be considered in such cases. First, if from the number and power of enemies, the effects of changing climate, or any other cause, a species is subject to great mortality, it requires a corresponding fertility to keep it in being; but when, for example, a fish lays millions of eggs, we may consider that, in the system of nature, eggs may be required as well as fishes. A human contriver or workman would, if he could, make a codfish outright, and not build up an egg first out of millions of molecules, and then hatch it into his fish. In nature, however, all intermediate steps may be regarded as necessary parts of a great plan, and the quantities of matter passing from the unorganised to the organised condition as a flux and reflux dependant upon laws essential to the system as a whole.

When we want live aphides to examine under the microscope in a vigorous condition, we must handle them with extreme gentleness, or their soft and delicate bodies will be injured and the creature killed. Their slightness of structure is, however, accompanied with great endurance of conditions that would be quickly fatal to many stouter organisms. Most insects would be rapidly killed by immersion in paraffin oil; but young and vigorous aphides will often live for some time, and occasionally for hours in this fluid, such as is burnt in lamps. If two or three of the insects are very carefully placed in a little cork cell, mentioned in the last paper, filled with paraffin oil, and covered with thin glass, they are in a handy condition for examination. The result of numerous experiments made with the best American petroleum oil, commonly called crystal oil in the lamp-shops, is that the survivals are very uncertain, but sufficiently frequent for the process to be well worth trying. They keep pretty quiet in the fluid, and it enables higher power to be used with convenience. A half-inch objective, magnifying about 100 linear, with a full-sized instrument, is very handy. The illumination should be varied; but one of the best ways is to use both an achromatic condenser and a lieberkuhn, or little silver reflector, at the end of the objective. The largest hole and central stop of the condenser will give a fine dark ground illumination. When used in combination with the lieberkuhn, it lights up the inside of the object, while the less transparent parts receive reflected rays from the silver surface. The student will find a great many cases in which this mode of treating a refractive and reflective object produces the best results. The eyes of the aphis seen in this way are like half mulberries, and the little eye projecting from the corner of the larger group is well displayed. Where the view of the compound eyes is a full-face one, the dark pigment is seen so strongly that its true position is concealed. A profile view shows the little lenses to be clear, like glass, and the pigment to be behind them. A comparison of these eyes with those of a common fly will show a considerable difference. The aphis lenses all look hemispheres, much like the projections of a mulberry, or blackberry, while the common insect form is hexangular—a shape produced by squeezing a number of globes together.

Many parts that looked plain with a lower power, appear beautifully ornamented under a higher one. The cornicles of the specimen before us are prettily imbricated, and the antennæ are very graceful objects. It is difficult, without dissection, to make out much of the internal organs, but the observer will be struck with the quantity of oily-looking globules. Indeed, between the incipient young ones and the fat or oil, there seems little room for anything else. This fat supply is probably connected with the resistance of the little animals to cold, and may serve as a food reservoir in bad times. Just below the knee-joint of the legs, at the top of the tibia, a small pulsating vesicle is noticeable, and if the leg is favourably situated, each beat of this little organ may be seen to send a wave-motion down a very thin and slender vessel. The colourless blood of the creature, we may suppose, is thus circulating, and Mr. Buckton found the pulsations from 120 to 180 times a minute. The breathing is effected by air-tubes (*tracheæ*), as in other insects, but their minute size makes them more difficult to see than they are in larger creatures, and in such their peculiar structure should be first studied. In their typical form, they resemble the flexible tubes often used in conveying gas to portable lamps, which have a spiral wire inside to prevent their collapsing. They glitter with a silvery or pearly sheen when the light glances upon them. In the aphis this wire is not discernible. The muscles of these creatures are very transparent, but some of them may be recognised in the legs without any colouring or dissection.

The amount of optical power possessed by these creatures seems in excess of the wants indicated by their habits. The young ones keep close to their parents and sisters, the whole family sucking away in an increasing crowd, with little room for individual motion. When an entirely new settlement is to be formed, winged females appear; and with these remarks we must close for the present.

THE CHEMISTRY OF COOKERY.

VIII.

By W. Mattieu Williams.

THE application of the principles already expounded to the processes of grilling and roasting is simple enough. As the meat is to be stewed in its own juices, it is evident that these juices must be retained as completely as possible, and that in order to succeed in this we have to struggle with the evaporating energy of the "dry heat" which effects the cookery.

It should be clearly understood that the so-called "dry heat" may be communicated by convection or by radiation, or both. When water is the heating medium, there is convection only, *i.e.*, heating by actual contact with the heated body. In roasting and grilling there is also some convection-heating due to the hot air which actually touches the meat; but this is a very small element of efficiency, the work being chiefly done, when well done, by the heat which is radiated from the fire directly to the surface of the meat, and which, in the case of roasting in front of a fire, passes through the intervening air with very little heating effect thereon.

I am not perpetrating any far-fetched pedantry in pointing out this difference, as will be understood at once by supposing that a beef-steak should be cooked by suspending it in a chamber filled with hot dry air. Such air is actively thirsting for the vapour of water, and will take into itself, from every humid substance it touches, a quantity proportionate to its temperature. The steak receiving its heat by convection, *i.e.*, the heat conveyed by such hot air, and communicated by contact, would be *desiccated, but not cooked.*

This distinction is so important, that I will illustrate it still further, my chief justification for such insistence being that even Rumford himself evidently failed to understand it, and it has been generally misunderstood or neglected.

Let us suppose the hot air used for convection cooking to be at the cooking point, as the hot water in stewing

should be, what will follow its application to the meat? Evaporation of the water in the juices, and with that evaporation a lowering of temperature at the surface of the meat, keeping it below the cooking point. If the air be heated above this, the evaporation will go on with proportionate rapidity, and as nearly 1,000 degs. of heat are lost *as temperature*, and converted into expansive force whenever and wherever evaporation of water occurs, the film of hot, dry air touching the meat is cooled by this evaporation, and sinks immediately, to be replaced by a rising film of lighter, hotter, and drier air, which drinks in more vapour, cools and sinks, to give place to another, and so on till the inner juices gradually ooze between the fibres to the porous surface, where they are carried away by the hot, dry air, and a hard, leathery, unmasticable mass of dissected gelatine, albumen, fibrin, &c., is produced, which, if given to a dog for the purpose of watching its effect on the animal, would render an unlicensed experimenter liable to prosecution under the Vivisection Act.

Now, let us suppose a similar beefsteak to be cooked by radiant heat, with the least possible co-operation of convection.

To effect this, our source of heat must be a good radiator. Glowing solids are better radiators than ordinary flames, therefore coke, or charcoal, or ordinary coal, after its bituminous matter has done its flaming, should be used, and the steak or chop may be placed in front or above a surface of such glowing carbon. In ordinary domestic practice it is placed on a gridiron above the coal, and therefore I will consider this case first.

The object to be attained is to raise the juices of the meat throughout to about the temperature of 180 Fahr. as quickly as possible, in order that the cookery may be completed before the water of these juices shall have had time to evaporate to any considerable extent; therefore the meat should be placed as near to the surface of the glowing carbon as possible. But the practical housewife will say that if placed within two or three inches, some of the fat will be melted and burn, and then the steak will be smoked.

Now, here we require a little more chemistry. There is smoking and smoking; smoking that produces a detestable flavour, and smoking that does no mischief at all beyond appearances. The flame of an ordinary coal fire is due to the distillation and combustion of tarry vapours. If such a flame strikes a comparatively cool surface like that of the meat, it will condense and deposit thereon a film of crude coal tar and coal naphtha, most nauseous and rather mischievous; but if the flame be that which is caused by the combustion of its own fat, the deposit on a mutton chop will be a little mutton oil, on a beef steak a little beef oil, more or less blackened by mutton-carbon or beef-carbon. But these oils and carbons have no other flavour than that of cooked mutton and cooked beef; therefore they are perfectly innocent, in spite of their guilty black appearances.

If any of my readers are sceptical, let them appeal to experiment, by putting a mutton chop to the torture, and taking its own confession. To do this, divide the chop in equal halves, then hold one half over a flaming coal, immersing it in the flame, and cook it thus. Now cut a bit of fat off the other, throw this fat on a surface of clear, glowing, flameless coal or coke, and, when a good blaze is thus obtained, immerse this half chop recklessly and unmercifully into *this* flame; there let it splutter and fizz, drop more fat and make more flame, but hold it there, nevertheless, for a few minutes, and then taste the result.

In spite of its blackness, it will be (if just warmed through to the above-named cooking temperature) a deliciously cooked, juicy, nutritious, digestible morsel, apparently raw, but actually more completely cooked than if it had been held twice as long, at double the distance, from the surface of the fire.

For further instruction, make a third experiment by imitating the cautious unscientific cook, who, ignorant of the difference between the condensation products of coal and those from beef and mutton fat, carefully raises the gridiron directly the flame from the dropping fat threatens the object of her solicitude. The result will be an ordinary domestic chop or steak. I apply this adjective, because in this particular effort of cookery, the grilling of chops and steaks, domestic cookery is commonly at fault. The majority of our City men find that while the joint cooked at home is better than that they usually get at restaurants and hotels, the chops and steaks are inferior.

I believe that this inferiority is due, in the first place, to the want of understanding of the difference between coal-flame and fat-flame; and in the second, to the advantage afforded to the "grill-room" cook by his specially constructed fire, where a large surface of glowing coke is surmounted by a sloping grill, whereon he can expose his chops and steaks to the radiation from a large glowing surface with a minimum of convection heat, the hot air passing in a current over the coke surface having such small depth that it barely touches the bars of the grill. (This may be seen by watching the course of flame produced by the droppings of the fat.) The same obliquity of draught prevents the serious blacking of the meat, which, although harmless, is unsightly and calculated to awaken prejudice.

The high temperature rapidly imparted by radiation to the surface of the meat forms a thin superficial crust of hardened and semi-carbonised albumen and fibre, which resists the outrush of vapour, and produces within a certain degree of high pressure, which probably acts in loosening the fibres. A well grilled chop or steak is "puffed" out—made thicker in the middle; an ill-cooked, desiccated specimen is shrivelled, collapsed, and thinned by the slow departure of its juices.

ENGLISH SEASIDE HEALTH-RESORTS.

By Alfred Haviland, M.R.C.S., F.R.M.C.S. Lond.

CLASSIFICATION.—LAND AND SEA WINDS.

(*Continued from page* 307, *Vol. II.*)

SOUTH-EAST.—This wind has an entirely different source from the one we last discussed. Before it reaches our shores, when it does so as a true south-east wind, and not as a part of a cyclonic storm, it has travelled over a greater variety of land and water than any other wind which crosses our surrounding seas. Its source and the varied character of its route combine to render it a wind not easily defined by reference to any one distinct property. In common with other winds from the south, it conveys heat and moisture — the former even to the Arctic regions, for we find Dr. Kane, who had charge of the second Grinnell Expedition in search of Sir John Franklin (1853-55), whilst at Rensselaer Harbour, writes in his diary, January 16: — "Again the strange phenomenon of the *south-east winds*. The late change in the barometer ushered them in, and all hands are astir with their novel influences." Again, "Jan. 18, wind howling on deck; a number nine gale; a *warm south-easter* directly from the land. The mean temperature of the wind is 20°. *Warm* as this may seem, our experience has taught us to prefer 40° with a *calm*, to 10° with a gale in the face." "That strange phenomenon, the warm

south and south-east winds which came upon us in January, did not pass away until the middle of this month (February), and soon after it had gone the weather continued for some time to reflect its influence." We find that the south-east wind is most prevalent during the spring and summer seasons, and that the months during which it blows the greater number of days are March, April, and June.

On the Eastern and Southern Coasts, to which it would naturally come first, during the years 1878-79, its frequency had a mean of seventeen days, whilst on the *West Coast*, during the same period, the mean was twenty-eight days. This anomaly will be explained when we illustrate this subject by wind charts, which will show how many of what are called "prevailing" winds are really nothing more than diverted winds, due to the physical peculiarities of the country around the station where the observations were made. This wind is interesting, as some dependence may be placed upon it when calculating on the chances of fine or bad weather. In fact, it appears that there are two kinds of south-east winds—one the harbinger of wet and stormy weather, whilst the other is the forerunner of fine; and as weather is of great importance to the visitors at the seaside, we will briefly describe the conditions under which this wind may be used as a weather prognostic. When the air is warm and moist, the barometer follows, and the sky *clear* down to the horizon, or flicked with cirrus clouds, and then covered with grey clouds, rain may be expected; on the other hand, if the air is dry, as indicated by the wet and dry bulb thermometer, or by the speedy disappearance of steam from a locomotive or other engine, the sky clear, except at the horizon, which is *hazy*, not cloudy, and the barometer rising, then the south-east will bring fine settled weather.

This wind comes to us warm, from the heated soil of the north of Africa, and laden with a certain amount of moisture from the Mediterranean Sea. One portion of this wind may travel to us up the Adriatic Sea, and then over the Swiss Alps, which would materially affect its original character as regards heat and moisture. Another route, however, is taken in a more southerly direction, and then we get it after it has passed through France. The latter is generally the rain-bearing wind, and often veers to the south and south-west, whereas the former portion has a tendency towards the east, thus remaining a dry wind and the source of settled weather.

The South.—This wind, like the last, differs in its character as it differs in its source and route to our coasts. One portion has travelled over the Pyrenees before traversing France; whilst another belt, after passing over Spain, sweeps across the Bay of Biscay, and has a more marine character than its companion to the east of Portsmouth. The south wind blows on the east coast about thirty-two days; on the south, thirty-five; and on the west, thirty-six days in the year.

The South Coast throughout its entire length looks towards France, Calais, and Boulogne opposite. Dover-Fécamp, which received the fugitive Charles II. after escaping from Brighton in Tallusell's coal-ship, lies in front of Hastings. Opposite the coast, between Beachy Head and Brighton, are Havre and the mouth of the Seine. The Rochers de Calvados, Barfleur, the Channel Islands, and St. Malo lie opposed to the Isle of Wight, Weymouth, and Portland Bill.

The remaining winds, namely, the south-west, the west, and the north-west, are all eminently sea winds, and will be noticed in our next article, when we purpose concluding this portion of our subject, and illustrating our coastal winds by a series of charts, constructed with the view of explaining how the physical features of England and its coasts influence their direction and modify their influence on our climate.

SECONDARY BATTERIES OR ACCUMULATORS.

By E. C. Rimington.

THE ideas of the general public concerning secondary batteries being, to say the least of them, rather hazy, I propose in this article to endeavour to show what a secondary battery really is, and to describe its chemical action.

A secondary battery or accumulator is a reservoir for storing electrical energy—not, as is popularly supposed, for storing electricity.

The probable reason why this false idea prevails arises from the fact that, in former times, electricity was believed to be a fluid, and, although it is now known that this cannot be the case, the convention is still often adopted as a convenient method of referring to and studying its actions. Coupling the idea of electricity being a fluid together with the term current of electricity and the analogy, frequently given, between electricity and water, the general public have arrived at the conclusion that a secondary battery or accumulator "stores electricity" much in the same manner that a cistern stores water. This is completely and entirely wrong. An accumulator does not store electricity; it stores electrical energy by means of chemical decomposition, and it is the reconvertion of the chemical compounds into their former state that gives us back the energy, absorbed in decomposing them, in the form of an electric current. If we immerse two plates of platinum in a vessel of acidulated water, and then pass a current from one or two Grove cells through this voltameter, we note that bubbles of gas come off from the surfaces of the two plates.

Where does this gas come from? It cannot be from the platinum plates, because the platinum remains unchanged, however long we continue the experiment; but in time the water gradually diminishes in bulk; the gas evolved must, therefore, come from the water—in other words, the water becomes decomposed or split up into the elements of which it is composed.

Let us now collect the gas given off from each plate in two separate tubes. On testing the gases thus collected, we find we obtain hydrogen in the tube over the platinum plate connected to the zinc or minus pole of the charging battery, and oxygen in the other tube, these gases being the elements of which water is composed, its chemical symbol being H_2O.

Now let us try the same experiment, but, instead of using a Grove cell, which has an electro-motive force of 1·9 volts, let us employ a Daniell cell, whose electro-motive force is rather over one volt; we find that no effect is produced. The reason for this is that the electro-motive force of the secondary battery formed by the liberated oxygen and hydrogen is greater than that of one Daniell cell (being, in fact, 1·45 volts).

Let us now try our former experiment, but, instead of having short pieces of platinum, let them be prolonged up into the tubes, in which the evolved gases are collected. In charging, include a galvanometer in the circuit, and note in which direction the needle is deflected; then disconnect the battery and circuit the voltameter through the galvanometer, when a deflection in the reverse direction will be obtained. This experiment shows that a current can be obtained from this arrangement; only, of

course, it would be a very feeble one and of short duration. Nevertheless it was from this that the first idea of secondary batteries was suggested.

In 1859 M. Gaston Planté constructed an accumulator of lead. He took two long strips of lead about 10 in. wide, separated them from each other by means of pieces of indiarubber, or tape, laid diagonally across between the two, rolled them up together spirally, and immersed them in a vessel of acidulated water.

This battery acts also through the decomposition of water; but not precisely in the same manner as the platinum plates. If we now perform another experiment and immerse two small plates of bright lead in acidulated water, then pass the current from two Grove cells through this small battery, we shall find that gas is not evolved at first from both plates, but only from the one attached to the zinc or minus pole of the charging source, while the other becomes of a brown colour. When circuited through the galvanometer, we obtain a current of longer duration than in the case of the platinum plates. Suppose we repeat the process of charging and discharging several times, first charging the plates in one direction, then discharging, and charging in the other direction, and so on. After some time, let us charge only in one direction, when, on discharging through the galvanometer, we find that we obtain a current for a far longer period of time than we did at first; when, on examining our plates, the one attached to the plus pole of the charging battery is found to be thickly covered with a layer of brown material, while the other is in a more spongy state than when we commenced operations.

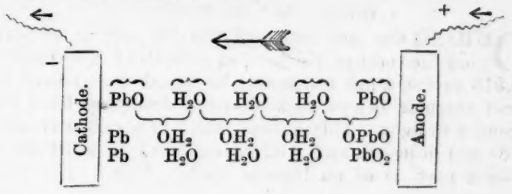
The difference in the chemical action which occurs in the two cases is that when the two plates of platinum were employed, platinum being a metal not attacked by free or nascent oxygen, the secondary action was obtained simply from the gases that were in close contact with, and to a certain extent occluded in, the surface of the platinum, the effect of which could be increased by rendering this surface slightly spongy; while in the case of the lead plates, lead being an easily oxidisable metal, the oxygen attacked the lead at the anode, or plate connected to the plus pole of the charging source, forming peroxide of lead (PbO_2), while at the cathode, or plate attached to the minus pole of the charging source, the hydrogen was given off in bubbles, provided the plate was quite bright; if, however, it was oxidised or partially converted into sulphate before charging, this oxide or sulphate was reduced by the hydrogen to metallic lead. The reason for alternately reversing the direction of the current in charging is that the peroxide of lead at the anode, which, when the battery is discharged, becomes converted principally into sulphate and a lower oxide, on recharging in the reverse direction should become reduced to metallic lead in a spongy condition, and thus be more easily acted upon at the next time of charging.

This process of continually charging, discharging, and recharging in the opposite direction is called forming the battery, and when it is continued until the plates are rendered of a spongy nature nearly through their entire thickness, the Planté battery is in its best condition.

This forming of the plates in the case of a large cell takes about eight months, which renders it rather a tedious and expensive process; so another Frenchman, M. Camille Faure thought he would obviate the inconvenience by mechanically coating the plates with an oxide of lead, such as litharge (PbO). or minium, or red-lead (Pb_3O_4), which, when once reduced, would give a coating of spongy lead in contact with the lead plates.

Plates of lead were taken, spread over with a paste of red-lead and dilute sulphuric acid, and sewn up in felt cases; a number of these plates were then laid side by side, the odd numbers connected to one terminal, and the even to another; they were then immersed in a vessel containing dilute sulphuric acid, and charged in the usual way, but the current was only reversed once or twice.

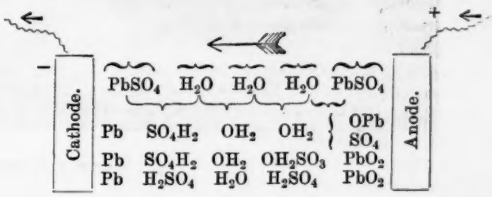
To understand the chemical action of a Faure cell, let us first suppose that the plates are coated with litharge (Pb O), or plumbic oxide, and are immersed in water (the reason dilute acid is employed being that water is such a very bad conductor without the addition of a certain quantity of acid; but, as far as the theory is concerned, we can suppose we are dealing with water alone.)



When a current is passed through the cell in the direction of the arrow, the water is decomposed, hydrogen being given off at the cathode, and oxygen at the anode. The hydrogen reduces the PbO by combining with its oxygen to form water, while the oxygen liberated at the anode combines with the PbO there to form PbO_2, or peroxide of lead.

Practically, then, the oxygen combined with the plumbic oxide at the cathode has travelled over to the anode to peroxidise the plumbic oxide there in charging, and on discharge, this oxygen travels back to the cathode, leaving Pb O on both plates as at starting.

Now, to take a case that is more likely to occur in practice; suppose we take a discharged cell that contained, when charged, dilute sulphuric acid (H_2SO_4) as the electrolyte, we have on both plates lead sulphate ($PbSO_4$), and if the dilute acid in the cell was fairly weak, it becomes practically water when the cell is entirely discharged.



We start with lead sulphate on both plates and water as the electrolyte; the hydrogen liberated at the cathode reduces the $PbSO_4$ by combining with the SO_4 radical, while the O liberated at the anode combines with a molecule of water of the $PbSO_4$ thus—

$$O + PbSO_4 + H_2O = PbO_2 + H_2SO_4.$$

As the charging continues, the acid in the cell gradually becomes stronger, till the cell is entirely charged, when we have the $PbSO_4$ converted into lead at the cathode, and into peroxide of lead at the anode, while all the SO_4 that was in combination with it has combined with the hydrogen of the water forming H_2SO_4 or sulphuric acid.

In practice it is, however, exceedingly difficult to reduce pure lead sulphate with an electrolyte of dilute acid, on account of the bad conductivity of the salt lead sulphate.

It will thus be seen from this description of the theoretical chemical action which goes on in the charging of an accumulator, that it is absurd to speak of a secondary battery as storing electricity; energy in the form of a current of electricity in charging produces chemical action,

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while in discharging chemical action produces energy in the form of a current of electricity.

The Faure accumulator has been lately entirely superseded by more convenient forms of cells, such as the Sellon-Volckmar, the Fitzgerald, &c., but the theory of the chemical action is the same for any form of cell in which lead is employed at both electrodes, with dilute sulphuric acid as an electrolyte.

A NEW DEEP-SEA FISH.

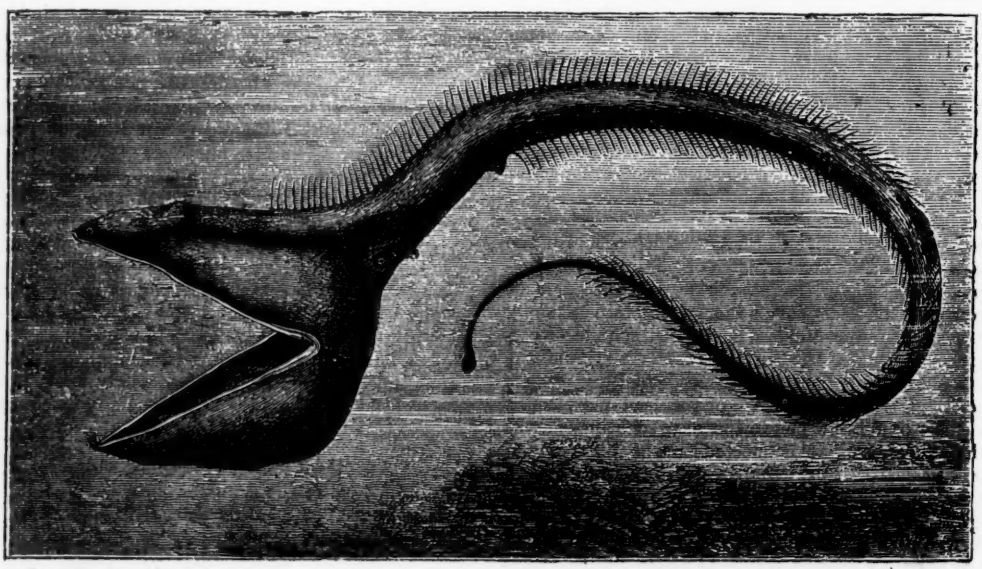
(*Eurypharynx pelecanoides.*)

DURING the last cruise of the *Travailleur* we found off the coast of Morocco, at a depth of 2,300 mètres (2,515 yards), a fish which may be regarded as one of the most singular beings that deep-sea dredgings have ever brought to light. This animal, which is about 0·47 mètre (18½ in.) in length and 0·02 mètre (⅘ in.) in width at the widest part, is of an intense black colour. The body, whose form is hidden in front by the abnormal mouth, recalls that of the *Macrurus*. It tapers off regularly from the anterior quarter, at which point is observed the external branchial orifice, and terminates in a point at the caudal extremity. The anus is located at the junction of the anterior third with the two posterior thirds of the body.

What gives this fish a very peculiar physiognomy is the arrangement of the jaws and the conformation of the mouth, which further exaggerate what Mr. Ayres has described in the *Malacosteus niger*. Although the head is short, scarcely 0·03 mètre (1⅕ in.), the jaws and suspensorium are excessively elongated, the later measuring no less than 0·095 mètre. It results from this that the articular angle is carried very far back, to a distance from the end of the nose equal to about three-and-a-half times the length of the cephalic portion. This suspensorium, as far as can be judged, consists of but two pieces—the one basilar, analogous to the temporal, and the other external, representing without doubt a tympano-jugal. The upper jaw is formed of a long and slender stylet, the situation of which should approximate it to the intermaxillary. The maxillary is wanting, unless we admit that these two bones are confounded.

Upon both jaws small dental granulations may be felt; and at the extremity of the maxillary bone are seen two hooked teeth, 0·002 mètre (1/12 in.) in length. The buccal orifice, as a consequence of such an arrangement, is enormous, and leads to a cavity whose dimensions are still more astonishing. In fact, the upper jaw is united to the sides of the head and of the fore-part of the body by an extensible cutaneous fold that permits of considerable stretching; and, between the branches of the maxillary bones, there extends an analogous cutaneous membrane which is much more dilatable, and contains, as shown by a histological examination, a large number of elastic fibres in bundles. It may be well compared with the mouth of the pelican.

As a consequence of the stretching of the jaws and the extensibility of the membranes, the mouth in the living animal forms, along with the pharynx, a vast funnel, of which the fish's body seems to be the tapering continuation. It is presumable that food accumulates in this pouch, and may be partially digested therein, a fact comparable with what has been pointed out in the *Chiasmodus niger*, Johnson.



THE EURYPHARYNX PELECANOIDES.

The locomotive organs are of the most rudimentary nature. The side fins are reduced to two very small appendages, whose position near the branchial orifice should make them correspond to the pectorals. The ventrals are wanting. At a distance from the occiput nearly equal to the length of the head begins a dorsal fin, which extends nearly the whole length of the back, without, however, reaching the end of the tail. The anal fin, which has a similar arrangement, has it origin at a few millimètres behind the anus, and ends at the same point as the dorsal. The extremity of the body is surrounded with a small membranous fold—a sort of rudimentary caudal fin. The delicate and flexible rays of these odd fins are not articulated, or, as far as can be judged from the animal preserved in liquor, united by a membrane.

The respiratory apparatus offers a structure which is as yet unique in bony fishes. We find six pairs of internal branchial clefts, and consequently five branchiæ. These latter are each formed of a double series of free lamellæ. The water makes its exit from each side through a very small orifice that forms a simple rounded cutaneous perforation, situated towards the level of the termination of the bucco-pharyngeal infundibulum. Neither a hyoidean apparatus nor opercular pieces are found.

Without entering into a description of the organs contained in the abdominal cavity, it is important to note the complete absence of a swimming bladder.

I propose to designate this fish by the name of *Eurypharynx pelecanoides.*

What place should it occupy in the ichthyologic series? This is a point difficult to judge of in the absence of more complete information as to its anatomy, and particularly as to its skeleton, which is not possible to examine in all its details in a single specimen.

It may be said that the fish offers affinities with the *Anacanthini*, with certain *Physostomi*, such as the *Scopelidæ*, the *Stomiatidæ*, and with the apodes. Although approaching these latter in the absence of ventral fins and in the imperfect opercular apparatus, it differs too much therefrom in its well-developed and free intermaxillaries to allow it to be placed in that group. As regards the *Scopelidæ* and *Stomiatidæ*, all the known genera of these families have a very widely opened branchial orifice. In the first, the intermaxillary forms alone the free edge of the upper jaw, and in the second, the maxillary enters therein for a part. It is to the *Scopelidæ*, then, that the *Eurypharynx* is related, inasmuch as it does not exhibit the hyoidean barbel that has up to the present been indicated as characteristic of the *Stomiatidæ*. And of all fishes placed in the *Scopelidæ* by naturalists, it is with the *Malacosteus niger* that we should be tempted to compare the animal under consideration, inasmuch as that fish alone presents us with the simple arrangement of the suspensorium noted above. But it is perhaps with the *Acanthini* that the affinities appear most real, either as respects the form of the body, which recalls that of the *Macrurus*, or as respects the absence of the ventrals, which is habitual in certain animals of this group. So, too, several *Ophididæ* and all the *Lycodidæ*—the latter with their branchial orifice reduced, although not to the point that occurs in our animal—furnish still another probability in favour of this view. However, the characters of the *Eurypharynx* are so decided that it must, in any event, be regarded as the type of a new family of which it will be the only representative, if future studies do not show that it must be joined to the genus *Malacosteus.*—L. Vaillant, in *La Nature.*

The production of gold in Australia seems to have diminished considerably since 1875, when the mines yielded 1,068,418 ounces. In 1876 the quantity sank to 963,760 ounces. In 1877 the figure fell to 809,653 ounces; in 1878, to 758,040 ounces; and in 1879 to 758,947 ounces. The year 1880 showed a slight improvement, as the yield rose to 839,121 ounces; and 1881 was better still, with 858,146 ounces.

A Large Steam Yacht.—A steam yacht, which it is said will be one of the largest yet built, has been ordered from Messrs. Shuttleworth & Chapman (Limited), of Erith, on behalf of Baron Arthur de Rothschild, of Paris, who already possesses the yachts *Eros* and *Passe-Partout.* This new yacht is to be extremely fast, and to be fitted with all the latest improvements.

NEWSPAPER SCIENCE.

By W. Slingo.

A FORTNIGHT since, Mr. Proctor, in a powerful article on "Lectures and the London Papers," complained of the treatment accorded to scientific addresses by the London Press. I think, however, that he will admit, on reflection, that the question resolves itself to some extent into one of supply and demand. I would not insinuate that a demand on the part of the public for scientific information does not exist, but that the matter which is supplied is of a description too inferior and slipshod to satisfy any demand, and that it is seldom read, and rarely trusted.* It is within the memory of every electrician that the panic in the gas-share market five years since was mainly the result of a brief but unwise confidence in newspaper science. I take it that there is not a genuine scientist in existence but would, if he had the choice, prefer no report to an incorrect one. On the other hand, those who desire to air an absurd fad are the readiest to welcome the assistance of the unscientific press, because, in the first place, imposition is in such cases an easy matter, and in the second no scientific reporter can be induced to give them a hearing. I was much amused a few months ago by a man who (ignorant that I had the honour of representing Knowledge) said to me:—"I do not want scientific opinion; it is no use to me." "Give me the British public," said he, "let them be my judges," and accordingly he showed me laudatory newspaper opinions in abundance. He may have been, and probably was, conscientiously confident in the efficacy of his so-called invention. But what is the result? The concern was in reality a scientific fraud. A public company was formed, and may even now, for all I know to the contrary, be in existence, but the few thousands of pounds subscribed can never bring any yield, but will, as certainly as this appears in print, do no good beyond effectively proving the fallacy of the invention.

To further demonstrate my point, I will quote a telegram from "Our Own Correspondent" in Vienna, which appeared in one of Saturday week's papers:—"An electrical accumulator of a very novel character has just been invented by Herr Prinz, who is known chiefly for his discovery of a method of making artificial turquoises. The inventor gave his first demonstration of his latest discovery yesterday, and the experiments were attended with complete success. *He first of all charged a substance, weighing about four kilogrammes, the composition of which he does not disclose, with electricity from a battery of six chrome† elements, the operation of charging taking fifteen minutes.* Then, disconnecting the battery, he inserted in the electrically-charged substance a Swan incandescent lamp. *This instantly gave a beautiful bright light, while with the chrome elements in their original condition, only a mild red light was obtained. The lamp began to burn at thirteen minutes to eight p.m., and it continued to give out a steady light until two a.m. this morning.*‡ According to Herr Prinz, the material he employs for the accumulator can be manufactured at a very trifling cost."

Can anything more preposterous than this be conceived? According to this, the force which in the original battery

* This is undoubtedly the case; but although at present our daily papers are not able to supply useful reports of anything scientific, they might do something in the way of noticing what is being done, especially in the case of such an experiment as the one which I have made in giving a course of scientific lectures in St. James's Hall.—R. P.

† Presumably bichromate of potash cells.

‡ I wonder if, had the battery been kept on for thirty minutes, the light would have lasted until 2 a.m. this afternoon?—W. S.

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can only impart a "mild red light" for fifteen minutes, may be transmuted into one which will give a "beautiful bright light" for six hours! After such outrageous twaddle we are told that, "Among those present at the demonstration was Privy-Councillor Herr Brunner von Wattenwyl, President of the International Electrical Exhibition to be held at Vienna in the summer, and an eminent authority on electrical science. In his view this discovery of Herr Prinz does not give to science a new accumulator, although it shows that by the aid of an electric current a new primary current may be set up, from which a light of long duration can be obtained." Then follows more nonsense about the "new accumulator," which, if there is anything in it at all, is no more than a galvanic battery, and would illuminate the lamp independent of the bichromate battery altogether.

It will be within the recollection of many that a year or so ago it was stated in certain professional papers that the editors of the dailies deputed men to compile scientific reports who were totally ignorant of the subject, because they thought they could then rely upon an absence of bias either for or against any particular system, and that criticism would be more independent.* Such will, I venture to predict, be the state of things until the general public, educated by a more diffused scientific press to a keener perception of the true and the false, demands early and accurate accounts of scientific lectures, discoveries, inventions, and exhibitions. The demand existing, supply will follow.

Reviews.

STUDY AND STIMULANT.†

By Richard A. Proctor.

MR. A. A. READE has done most useful work in collecting together the experiences and opinions of many persons who have devoted a large portion of their time to study, upon the use of stimulants. I can imagine nothing more likely to exert a wholesome influence on young men possessing ambition of the healthier kind—ambition to do such good during their lives as is within their capacity—than the study of such experience as is here gathered together. They will find that the best workers use little stimulant or none, and mostly use such stimulants as they do take, rather after than before work—in fact, rather as a sedative than as stimulant. The experience is, indeed, widely varied, and it is evident that some who have communicated their ideas to Mr. Reade have given little attention either to the physical or to the physiological questions involved. But their experience is none the less valuable. One of the letters which deals most philosophically with the subject (from Dr. Alexander Bain), shows that John Stuart Mill, who drank moderately and smoked not at all, held entirely erroneous ideas as to the probable influence of vinous stimulants on the appetite for food. Mill thought that if he gave up wine, he would be apt to take more food than was necessary; but one of the most marked effects of total abstinence from wine is an increased control over the appetite; of course, the habitual use of strong liquors in excess destroys the appetite for food altogether. Dr. Bain writes as follows:—"The difficulty that presses upon one in relation to the whole subject is this—that, in organic influences, you are not at liberty to lay down the law of concomitant variations without exception, or to affirm that what is bad in large quantities is simply less bad when the quantity is small. There may be proportions not only innocuous, but beneficial—reasoning from the analogy of the action of many drugs which present the greatest opposition of effect in different quantities. I mean this not with reference to the inutility for intellectual stimulation, in which I have a pretty clear opinion as regards myself, but as to the harmlessness in the long run of the employment of stimulants for solace and pleasure, when kept to what we call moderation." This is the difficulty so far as the theoretical question is concerned. The effect of stimulants, whether used as such or as sedatives within short periods of time, is easily ascertained. In a few weeks the effect of a change of system may be noticed. But the effects in long periods of time are not so easily determined. Albeit, the general result of the experience gathered together in the present volume is that none of the so-called stimulants have any real value in helping literary or scientific work, while in a great number of instances they seriously diminish the working energies.

I may give the following result of my own experience in influencing not my opinion only, but my course of action. I was particularly anxious to appear at my best before the audiences which gathered to hear my lectures at St. James's Hall. It will be believed, then, that if I thought any brilliancy or fervour (even though temporary) were to be obtained from the use of stimulants before lecturing, I would have used them. The best proof that I hoped for nothing of the sort will be found in this, that I prepared for each lecture of the six by abstaining absolutely from food from breakfast-time at nine until six, when I took one chop, one piece of dry toast, and a cup of tea without milk or sugar. I never lectured with greater ease or comfort to myself. On returning home about an hour and a half after each lecture, I took a rather hearty supper and one glass of the best Bourbon whisky and water. After this, good sleep followed. The course of lectures was thus given with the least possible amount of strain.

* This explains everything. If the same system were only applied in politics!—R. P.

† "Study and Stimulant; or the Use of Intoxicants and Narcotics in Relation to Intellectual Life, as Illustrated by Letters from Literary and Scientific Men." Edited by A. Arthur Reade. (Abel Heywood & Son, Manchester; and Simpkin, Marshall & Co., London.)

THE FACE OF THE SKY.

From April 27 to May 11.

By F.R.A.S.

THE student will, as usual, keep a daily watch upon the Sun for indications of disturbance. The aspect of the night sky may be gathered from Map V. of "The Stars in their Seasons." Mercury is now an evening star, and after the first week in May may be seen with the naked eye, after sunset, over the W.N.W. horizon. He is remarkably well placed for the observer just now. Jupiter must be looked for as soon as ever it is dark, as he is rapidly approaching the west. He travels towards η Geminorum, but to the north of that star. The phenomena of his satellites during the succeeding fortnight are the disappearance of I. in occultation at 8h. 28m., p.m., on the 29th. On the 30th the egress of the shadow of I. at 8h. 56m., p.m., and the ingress of II. in transit at 9h. 12m., p.m. On May 7 the ingress of the shadow of I. will happen at 8h. 34m., p.m., and the egress of the satellite casting it at 9h. 56m., p.m. After this we shall bid good-bye to Jupiter until October. Uranus, the only other planet visible, may be found about 1½° north of the double star τ Leonis.

There are no visible occultations of stars by the moon during the next fortnight. The moon's age at noon to-day (the 27th) is 19·9 days, and so on to May 6th, when it will, of course, be 28·9 days. At noon on the succeeding day she will be 0·6 day old; so that, for our present purpose, she will scarcely be visible before the 9th or 10th. For the next 24 hours she will be in Sagittarius, as she will during the whole of the 28th, passing into Aquarius on the 29th

and remaining there during the 30th and the 1st of May. On May 2nd she travels into Pisces, which she does not quit until the 5th, when she passes into Aries. During the later morning hours of the 7th she moves into Taurus, through which her path lies on the 8th and part of the 9th, travelling into Gemini on the latter day. She continues in that constellation throughout the 10th, and on the succeeding day will be found in Cancer, where we leave her.

"Let Knowledge grow from more to more."—Alfred Tennyson.

Letters to the Editor.

Only a small proportion of Letters received can possibly be inserted. Correspondents must not be offended, therefore, should their letters not appear.

All Editorial communications should be addressed to the Editor of Knowledge; *all Business communications to the* Publishers, *at the Office, 74, Great Queen-street, W.C.* If this is not attended to, delays arise for which the Editor is not responsible.

All Remittances, Cheques, and Post Office Orders should be made payable to Messrs. Wyman & Sons.

The Editor is not responsible for the opinions of correspondents.

No communications are answered by post, even though stamped and directed envelope be enclosed.

MULTIPLICATION [759].

[791]—By referring to the *English Mechanic* for April or May, 1875, under article "Singular Mathematical Fact," two rules are given as communicated by me, signed "S. J."

The first rule I learnt more than sixty years ago, and have found it very useful; the second rule I devised for the article:—

$$38 \times 36 = (38+6)3 = 132$$
$$\text{and } 6 \times 8 = 48$$
$$1368 \text{ product.}$$

$$87 \times 34 = (87+4)3 = 273$$
$$\text{and } (87-30)4 = 228$$
$$2958 \text{ product.}$$

The two rules may be applied to multiplicands and multipliers consisting each of three figures. James Smith.

P.S.—The editor, I believe, was abroad during April and May, 1875.—J.S. (See the "Geometry of the Two Rules.")

EASY MULTIPLICATION.

[792]—I was much interested in Mr. Green's method of multiplying numbers up to 19×19. I find it much easier to calculate in his way up to 99×99 than by the usual system, in all cases where the left-hand figures are the same. Slightly alter Mr. Green's statement [this part was mine.—R. P.] and say—

$$(10a+b)\ (10a+c) = 10a(10a+b+c)+bc$$
$$\text{Thus } 97 \times 95 = 90(90+7+5)+35$$
$$(90 \times 102)+35$$
$$9180+35 = 9215.$$

If we have to multiply different left-hand figures, say, $(10a+b)\ (10c+d)$, and the larger (a) be taken as multiplicand, the statement is rather more complicated, viz.:—

$$10c\ (10a+b+d)+d\ (10a-10c)+bd$$
$$\text{Thus, } 35 \times 24 = 20\ (30+5+4)+4\ (30-20)+20$$
$$= (20 \times 39)+40+20$$
$$= 780+60 = 840$$

But is this easier than the usual method? A. G. T.

STORED ENERGY.

[793]—Your note to letter 733 seems hardly to explain the question asked; the initial state of the two springs is different, while the final state is the same. From this it is evident that they must both go through a series of changes, during which energy is given off, till they are both in exactly similar condition; and, I think, the final states being the same, we are justified in supposing that any molecule of the coiled spring uncoils at the moment of its solution. Now, in the case of the coiled spring, the energy given out is equal to the sum of that due to chemical action and that due to the peculiar configuration of the mass; and in the case of the uncoiled spring it is equal to that due to chemical action only. The amount of heat due to chemical action is constant, and that due to the peculiar configuration is equal to the thermal equivalent of the mechanical work the spring would do in uncoiling. Hence, we see that more heat would be developed in the case of the coiled spring, and that, as the chemical action takes place under similar conditions, the time of solution would be the same.

S. Skinner.

VALUE OF GOLD.

[794]—Early in this century gold was made the sole standard of value in England. All commodities are measured by it. We price everything in it. Gold, like other commodities, is ruled by supply and demand.

For thirty years past the production has been falling off, and is now less than one-half what it was. Meantime, the consumption in the arts, &c., has been increasing, and it is estimated that at present twelve or fifteen millions sterling of gold disappear in this way annually. For the past ten years this demand has been eclipsed in importance by the demand for coinage. Germany, America, and Italy have been securing immense stocks of gold. The metal, therefore, becomes scarcer, while the desire to obtain it increases day by day. There is a growing appreciation of it; people are willing to give more land, or tea, or whatever it may be, in exchange for it. In other words, prices of everything are falling, and must continue to fall till the appreciation be checked. Thus the agricultural industry suffers, and it will not make their hardships the easier to bear, when they learn that their fellow-subjects and competitors in the Indian portion of the empire are reaping large profits because they work under conditions exactly the converse of those described above.

In India silver is the standard of value, and this metal is depreciating while gold appreciates. While the English farmer must part with more corn in exchange for less money, the Indian gets more money for less corn.

Mr. Goschen's speech has evoked articles in the *Statist* and *Spectator* of the 24th ult., and in the *Bullionist* of March 10 and 17.—I am, Sir, yours, &c., Paul F. Tidman.

LEARNING LANGUAGES.

[795]—In the papers and letters which have appeared in Knowledge on the subject of learning languages, the Hamiltonian system is highly recommended. There is no doubt of its being an excellent system, but it appears to me to go only half-way to perfection. The Robertsonian method preceded it, and earlier still the "Méthode Jacotot"—much used many years ago in France. By this plan the memory is largely called into play, and words once learnt are not likely to be forgotten. In a house we find a storehouse or cupboard—a most necessary requirement. We store our tea, our sugar, fruit, spices, &c., therein, and these are ready for use when we want them. In a similar manner, the mind should have placed in it a store of words—and not only of words, but of phrases, of different parts of speech and their inflections, so that we may take them out again when wanted. By the Hamiltonian method you get the meaning of words quickly at the time, but they are generally forgotten again, until repeated translation fixes them in the memory. By the Jacotot system they are put in the cupboard, or mind, at once, and drawn upon when required. It may be said that the task would be a heavy one—to learn a book by heart—but for this there is no occasion, for when a person can say six pages of a book by heart, he knows half the language, its phrases and inflections.

I may state my own case. I read and speak French. I can read well the language of Dante and Goldoni, and thoroughly enjoy the Spanish of Cervantes.

I read, for instance, every day, say, a page of Télémaque interlinearly, and learnt by heart also two sentences. But I also repeated by heart the two that I had learnt the day before, and the two before that, always saying off by heart daily the whole I had learnt; so that after a time I had read the whole of the book, and was able to repeat, say, six pages by heart. These I have never forgotten, and in those six pages I consider I have learnt the best part of a language.

Thus a very little additional trouble to the student by the Hamiltonian method will give him a speedier result. W. P. Bain.

[Mr. Bain's method is an excellent one, as I know from experience of my own.—R. P.]

XUM

LARGE SUN-SPOT.

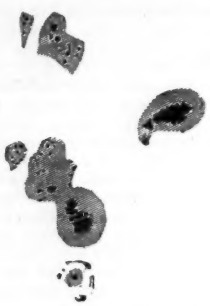
[796]—About six o'clock, April 3, I glanced at the sun as he was nearing the western horizon, and as there was a little mist about the horizon, which made it easy to look at him with the naked eye, I could distinctly see a black spot a little to the right of the centre. I called the attention of two friends to it, and they also saw it quite easily.

On Saturday and Sunday following I observed the sun with my telescope, and then perceived one rather large spot and several smaller ones, and on the latter day I showed them to my wife and several friends, and remarked to them that I believed that if we could get a naked-eye view of the sun, we should be able to see the larger spot, and so that opinion has been confirmed since.

Seen through the telescope, it was triangular shaped, the central black part, or umbra, being all in one, and not divided into several, as was the case in the great spot seen last November.

Excelsior.

A subscriber, F.R.A.S., sends us this picture of the large sunspot.



April 15, 9.30 a.m. (with 4-in. power 96 Ramsden).

[Our correspondent remarks on the "peculiar series of little bridges in one of the spots." "I watched them carefully," he writes, "for fully half an hour, and there seemed a most violent action going on around each bridge; so much so, that I contemplated a violent disruption and equalisation of the whole mass into one chasm. The whole spot seemed 'all alive,' whilst the smaller ones were passive. Towards the close of the half-hour, the right-hand large spot seemed to wake up, and numerous indentations became manifest. After a while, the undulations seemed to settle down as I drew them, and after that a more peaceful state seemed to reign."]

SATURN'S RINGS.

[797]—Mr. Ward points out (775), an objection to Professor Adams's theory about Balle's figure of Saturn in "Phil. Trans.," which appears to me fatal to that theory. Professor Adams, indeed, foreseeing the objection, is forced to have recourse to the rather lame expedient of supposing that the clause about the notches quoted from Balle "has been added or altered in some way" (Monthly Notices, R.A.S., Vol. XLIII., No. 3, p. 94). But there is an additional reason, not yet pointed out, for thinking that the indentations in the figure were intentional.

In his paper, read before the Royal Astronomical Society, and quoted above, Professor Adams says, "The paper was first folded twice in directions at right angles to each other, so that only a quadrant of the ellipse had to be cut." Now, I have carefully examined the original cutting with a magnifying-glass, and I am prepared to say that, while there is a very distinct perpendicular fold, there is not the slightest trace of any horizontal fold. This may, at first sight, appear to be unimportant, but it is important—in this way:—If the paper had been folded in four, one cut would have made both notches, and there would have been only one mishap. But being folded in two, it follows that Balle made the same mistake (?) twice over, first in beginning the cut, and secondly in ending it. As a confirmation of the objection brought forward by Mr. Ward, I think this is not altogether unimportant.

The satisfactory thing would be to find Balle's letter. We should then know whether the cutting was his own, or whether (what is very possible) it was merely made by Oldenburgh from a drawing in Balle's letter. I have made every search, however, in the archives of the Royal Society, and I am tolerably certain that neither the original nor any copy of the letter remains there. It was probably returned to Sir R. Moray as soon as Oldenburgh had done with it.

Science Club, Savile-row, W. Herbert Rix.

SUN AND MOON OF GIBEON.

[798]—As you cannot forward my letter to Mr. Garbett, for want of his address, I wish to say that in it I expressed the fact that the LXX. version does not seem to bear out his rendering, "Be thou silent," though the margin gives this as the Hebrew. I am not an Hebraid, but these translators would surely not have used *στητω*, and *ἐν στασει*, and *ἐστη*, if they had understood it bore the sense Mr. G. would put on it, whatever the physical fact may have been. A different Greek verb is that "to keep silence,"—*σιγαω*. I do not know whether you would admit a theoexegetical discussion in your columns, which are not intended for such. Mr. Garbett quotes Bryant as an authority, but I do not think he is much thought of in these days of modern research. H. M. W.

[The Septuagint is not a very excellent translation. In English, "Be thou still" would be near the mark, as conveying the actual force of the Hebrew, which may mean either "be silent," or "stay still."—R. P.]

A PHENOMENON.

[799]—I am afraid I am rather late in mentioning a peculiar phenomenon I observed some time ago, and which no one could explain to me. On April 5, at about 5.20 p.m., at Wimborne, in Dorset, while out on a hill near there, I chanced to look up at the sun, when I observed at a distance from that body of about twenty times his diameter, or perhaps a little more (I cannot give the distance astronomically), at the same distance above the horizon as he was, a small piece of rainbow. This was to the west of the sun; it was about twice his diameter in length, and stood vertically, as though part of a large rainbow-like halo. There were no clouds about, but only a sort of cloudy haze, which was neither cloud nor haze, and had no definite edge, but gradually melted into the clear sky some distance above the horizon. The sun and rainbow were just within this haze, where it was appreciably thick. No rain came after, nor could I hear of any having fallen at that time anywhere about the district; and, besides, I was not between it and the sun, but both were before me. Several other persons observed it; one was with me, and plenty more mentioned it to me afterwards, but none could account for it. Hoping (if it be not too late) to see an explanation soon, Imperitus.

April 18.

[Undoubtedly part of a solar halo; in other words, formed by refraction of sun's light through ice-prisms.—R.P.]

FLOURY AGAINST WAXY POTATOES.

[800]—I am much obliged to "E. W. P." for his suggestions (783) regarding the difference between a waxy and floury potato. They are in strict accordance with my own belief, but in practice I find great difficulty in growing the quality desired, for I often find floury potatoes produced on land rich in nitrogen, more especially if slow of decomposition; whereas land poor in nitrogren may—for instance, in a sunless, wet year—have very waxy roots; so that I presume sunlight or rain has as much as manuring to do with it.

With Dr. H. Muller's investigations I have been acquainted for some time, but, from some known facts, I think many of his deductions will require confirmation before being accepted as truths. For instance, every farmer knows that even after the severest winters his plough in the spring turns up many potatoes in nice fresh condition, from only a few inches deep. These roots must have been frozen through for days, and even weeks, together, and yet kept quite sound.

It is also known that potatoes frozen, or believed to be frozen, in the drill, pet, or clamp, will in many cases turn out little the worse if let alone till the frost is some time off, whereas if immediately removed, nearly all will be wasted.

In my experiments the ashes used were fine coal cinders from under the engine furnace, and both lots of potatoes were removed from the place where frozen at the time and immediately cooked.

Farmer.

SINGLE EYE-GLASSES.

[801]—Mr. Kling, in his letter, No. 788, on "Single Eye-glasses," seems to me to miss the obvious meaning of the author of "How to Use the Eyes." I take it that the meaning of the passage is that single glasses are of themselves hurtful, whether they help the wearer to see better, or are worn for a less worthy purpose.

I think the discussion as to the benefit of spectacles with lenses of different powers must have been quite set at rest, for a year or two ago I had to take to spectacles, and was ordered by a surgeon to one of the ophthalmic hospitals to obtain a pair of unequal strength. I should imagine that in case one eye is weaker than

another, the lenses must do harm, if of equal power, instead of good. Myopia.

[I am particularly interested myself in this question, seeing that my left eye is *very* short-sighted (I should use power "12" if I used any glass at all), while my right eye shows distant objects with perfect distinctness. With adapted spectacles I see double. But as I get along very well without glasses, this does not trouble me.—R. P.]

LETTERS RECEIVED.

A. T. Harvey. I fancy a State Minister of Science would find all his time taken up in distinguishing honest workers from mere money seekers.—W. W. Bishops. In Knowledge for May 4.—J. H. Thomson. Many thanks; but the scales would be too perplexing to most readers.—N. K. Punshon. If you try to give definite shape to the ring you suggest round Mira, you will find that the variations of the star cannot possibly be accounted for in measure and degree by that theory.—D. Robertson, Ione. Not yet written. —F. A. Litton. Answered elsewhere. Dr. H. Draper published no such work.—S. Dobson notes that colour-blindness is less common among women than among men.—J. T. Pope. Squaring the circle not to be effected in that way.—S. Skinner, H. H. Ellis., J. C., A. H. A., Ern. J. R. Thanks.—W. Miller, H. K. Muirhead. The difference between stored energy and the actual use of such energy is surely too obvious to need pointing out.—H. Stock. There *is* that trouble about bulk. A balloon to raise even the human body alone must be at least 1,000 times as bulky; to raise a car-load of travellers an inconveniently large balloon would be wanted, and the wind would play unpleasantly with such a bulky monster.—F. H. E. (1) A comet's opposition is not necessarily its aphelion; (2) the inclination of its orbit may exceed or fall short of its greatest latitude, if this is what you mean by its greatest inclination. (3) The "Vade Mecum de l'Astronomie" is not known to me; if it suits "every one not born with a telescope in his mouth," it must be widely useful. I know of no "work in English that does."—R. R. Baines. Many thanks, but information crowded out.—E. Anderson. If a Southerner can be called a "Yankee," your kind wish is already fulfilled. Your triangle puzzle is perfectly dreadful. I agree with you (but that counts for nothing). The other bosh about the constitution is, I fear, propounded very much as you put it. My old theory (for particulars inquire at Century Club, New York) comes in well here. There 's a deal of nonsense about.—Hallyards. Fear the derivations rather too recondite.—Original Subscriber. More find difficulty in adding numbers including both odd and even, than in adding all odd or all even numbers.—G. G. S. There is now *no* correct way of pronouncing Latin. You may say *Roostiecoos* or *Rusty Cuss*, *Viesissim* or *We kiss 'im*.—W. H. Wilkinson. Luminosity from heat does not imply burning away or combustion. You *may* suppose those other ideas correct, though, probably, they are not so.—A Stonebreaker, J. C. S. Thanks, but method rather cumbrous for the work done.—F. S. L. It is not necessary, in the squirrel puzzle, that the squirrel be rigidly attached to the man. The squirrel's rotation, like the madness of the famous dog, is understood to have been intended merely "to suit his private ends." —A. Francis. Now.—A. B., S. J., R. Willing. Subject too abstruse for explanation in these columns.—T. A. Would only confuse our readers.—F. Malkin, Polaris. H. is honest, though mad; the other is neither.—W. H. Lloyd., Reader of "Knowledge," R. W. W.—Justitia Omnibus. Of course, "Mad Tom's" paradox is but a joke.—Long Tom. Your letter about Mad Tom and H. is amusing; and I would insert it; but space is cramped, and—would you believe it?—there are some who take such letters for solemn earnest, and gravely rebuke me for inserting them.— Canes Venatici. Will try, but we are low-priced, and cannot afford so much that way as papers like the one you name, not only high-priced, but not giving half-a-page weekly of original matter. Set our ten columns weekly of paid matter against illustrations (without exception borrowed), and you will admit that for one-third the price we give a fairer equivalent.—G. B. In Knowledge for May 24.—J. R. Clapham. Quite agree with you that he could, if he would, have given very interesting matter, at very little trouble and considerable profit to himself. But there are those who deem it an offence to point out errors in their views—a mortal offence to prove their views erroneous.—W. Miller. On return to town will prepare a paper on the subject.—R. L. L., A. Wishart, and many others. Have asked our assistant who spoke so highly to us of the Loisettian system to say whether he is still satisfied of its value.—Incredulitas. Cannot reply, of my own knowledge, about the Loisettian system.—P. J. L. The lady who wrote the article on the Divided Skirt would not care to have her photograph taken for public sale. But in any case it would show nothing of the divided skirt, which is wholly concealed under the skirt of the dress—*this* skirt not being divided.—G. J. Padbury. That is a matter for the publishers.—M. R. Doubtless, granted a sufficient supply of heat, or other form of energy for decomposing water, water would be an inexhaustible fuel-supply.—H. Godwin. C. F. Hodgson & Son, Gough-square, Fleet-street.—H. Vallance. First deal puts card in middle seven, second puts it in middle three, third makes it the middle card.— F. B. Allen, E. Holt, Professor E. J. H., Ph.D. Our readers so nearly unanimous, that to balance your one letter in favour of stays we ought to put in, at least, a hundred against them, for which we have not space.—Rev. Terence O'Flanagan. Regret you were disappointed; but question is not comment. Imagine the Padre Secchi would have opened his eyes had he heard that the Roman Catholic Church maintains, or you seem to imply, that the earth is flat. You mistake, however, in supposing that Galileo advanced the contrary. It was not necessary. For no men of science in his time needed to be told that the earth is a globe.—W. Rowe. Know nothing on either point.—One Already Reformed in Dress. Surely very few girls have the barrel shape you speak of. All in my own household look at least as shapely, and far more graceful, since adopting the reformed dress.—Chev. De L., E. C. Biscoe. The testimonial is true as far as it goes; but it does not go very far.

Our Whist Column.

By "Five of Clubs."

THE ECHO OF THE SIGNAL.

When trumps have been signalled by your partner, and you have yourself length in trumps, it is most desirable to let him know as much, that he may not, by continuing to lead trumps, extract two for one or none of the adversaries'. It often happens that you are not able to indicate length in trumps, under these circumstances, by your return lead; or the lead of trumps may be delayed, and you may wish to indicate your trump strength at once. Under such circumstances you should "echo" the signal, if you have an opportunity of so doing; that is, you should play an unnecessarily high card before a low one, in any suit, trumps or plain, in which you may be able thus to indicate the possession of four trumps at least. This "echo" signal, in fact, has, like the signal for trumps, its negative as well as its positive aspect. Just as not signalling for trumps when you have the opportunity means that you have not more than a certain degree of strength in trumps and plain suits combined, so not to echo the signal, if you have the chance, means that you have not more than three trumps.

You cannot readily echo, as you can signal, by the discard, for when your partner has signalled, and the opponents lead a suit which you can ruff, you would not discard from a plain suit, but take the trick, whether you held more or fewer than four trumps, in order that you might lead trumps in response to the signal.

It is well to notice, in regard both to the *signal* and to the *echo*, that, failing to observe either form of signal on the adversaries' part, or the absence of either when there has been an opportunity for its display, is as mischievous as failing to notice such signals or their absence in your partner's play. Thus, suppose one of the adversaries leads trumps, really in response to his partner's signal, but as you suppose, not having noticed the signal, from his own strength; if the chance of forcing him arrives, you seize it, thereby playing his game, or when you should force the hand of the partner who signalled you, omit to do so, supposing him to be weak in trumps. In fact, failing to notice the play of the adversaries with regard to signal is apt to prove a more dangerous error than failing to notice your partner's signal; for in one case, your play, in consequence of your carelessness is weak and incorrect in presence of trump strength of the adversaries, the consequences of which can hardly fail to be disastrous; in the other case, you fail properly to support your partner, but his trump strength is there all the time, and will probably save you at least from irremediable disaster. In the latter case, you may probably fail to make a game which might have been won, and despite the saying that the cards never forgive, you may retrieve the error in half the number of events. But in the other case, you are very likely to lose a game which might have been saved, and there is no way of restoring a game which has been lost.

It is hardly necessary to observe that whether a player approves or not of the general principle of signalling, wherever required, at Whist, he must play at a disadvantage if he fails to employ the system against players who studiously employ it. But if your partner is habitually careless with regard to the signal, while your opponents are observant, it is well to avoid signals of all sorts, since they inform the adversaries, and tell your partner nothing.

(To be continued.)

XUM

Our Chess Column.

By Mephisto.

Game Played at the Divan on the 21st inst., Hampe—Allgaier.

White. Mephisto.	Black. Tschigoryn.	White. Mephisto.	Black. Tschigoryn.
1. P to K4	P to K4	16. BtakesPch(*e*)	R takes B
2. Kt to QB3	Kt to QB3	17. P to Kt5	R takes R (*f*)
3. P to B4	P takes P	18. Q takes R(*g*)	Q to Rsq
4. Kt to B3	P to KKt4	19. PtakesKt(ch)	B takes P
5. P to KR4	P to Kt5	20. RtoKtsq(ch)	K to B2
6. Kt to KKt5	P to KR3	21. Q to K4	Q to R3 (ch)
7. Kt takes P	K takes Kt	22. K to Q sq	B to Q2
8. P to Q4	P to B6	23. P to Kt4 (*h*)	R to K sq (*i*)
9. P takes P	B to K2	24. Q to Kt6(ch)	Q takes Q
10. B to B4 (ch)	K to Kt2	25. BtakesQ(ch)	K to B sq
11. B to K3	B takes P (ch)	26. B takes R	B takes B
12. K to Q2	P to Q4 (*a*)	27. R to B sq	K to K2
13. P takes P	Kt to R4 (*b*)	28. P to Q6 (ch)	P takes P
14. B to Q3	B to K2 (*c*)	29. Kt to Q5(ch)	K to Q sq
15. P takes P	Kt to KB3(*d*)	30. Kt takes B(*j*)	resigns

(*a*) 12. P to Q3 would have given him a safer game, with a better chance of defending himself.

(*b*) Black had not much choice; he now has two pieces in precarious positions, a disadvantage that often arises when the defence of B to K2, followed by R5, is adopted in any gambit. Bad as it may look, Kt to Kt sq seems preferable.

(*c*) P to QKt3 seems necessary to ensure the safety of his Knight.

(*d*) For had the Pawn been advanced, Black might have played B to Kt4, which he cannot do now without losing time; if 15. B to Kt4, 16. Q to B3, and White gets a strong game.

(*e*) A further sacrifice of a piece justified by the position.

(*f*) If Kt to K5 (ch), 18. Kt takes Kt, B takes P (ch), 19. K to B3, and Black's position is not much improved.

(*g*) Not easy to decide which is best in this interesting position. Q takes R gives White more liberty of action. Black dare not withdraw his Knight from B3 on account of Q to R7 (ch), &c.

(*h*) If R to R sq, B to Kt5 (ch), &c.

(*i*) This loses the game. Black ought to have played R to KKt sq.

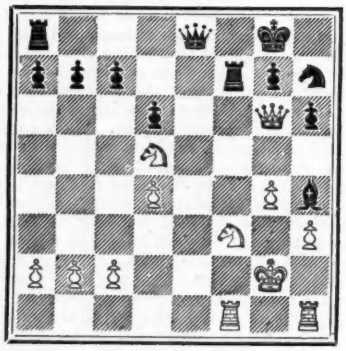
(*j*) It is obviously better to have won this Bishop in preference to P takes Kt, for now White's Pawns are far stronger.

Position after Black's 24th Move, Q to K sq.

In a game played on the 19th inst.

A. G. Sellmann (Baltimore).

Black.



White.

Mephisto.

The game proceeded with—

Kt takes B	Q to K7 (ch)
K to Kt3	R takes R
R takes R	Q takes R
Kt to K7 (ch)!	K to B sq

(If K to R sq, White plays Q to K8 (ch)! Black dare not take on account of KKt to Kt6 mate; if then Kt to B sq, White can safely take the Rook after KKt to Kt6 (ch), K to R2, for the White King will be able to escape perpetual check by working over to his Queen's side.)

Kt (K7) to B5	Q to K8 (ch)
K to R2	Q to Q7 (ch)
Kt to Kt2	Q to KKt4

Q takes Kt, and White won.

SOLUTIONS.

Problem No. 84, p. 228.

1. R to B4!	P takes R, or		K to Kt 4
2. Kt to B5 (ch)	K to Kt4	Q to R4 (ch)!	K takes Q
3. Kt takes P, mate		Kt takes P, mate	

If B moves, mates accordingly.

No. 85, by J. C. S., p. 242.

1. Q to K7!	Kt takes Q, or		B takes Q
2. K takes P	Anything	B takes Kt	Anything
3. Kt or R mates accordingly		Kt to B7, mate	

THE INTERNATIONAL TOURNAMENT.

As regards the number of entrants, the Tournament has not quite come up to expectations; but, in point of strength, it will certainly eclipse any previous Chess contest of the kind. It may, perhaps, in the interest of good play, be advantageous that we have only the very best players assembled to do battle with each other, as the severest test must necessarily favour and produce the best player. Weak players introduce a certain element of chance in a Tournament which it may be desirable to avoid. The minor Tournament has taken over several players who, but for its existence, would have ranked amongst the competitors in the major Tourney. Yet it has rather taken us by surprise that, with one solitary exception, none of the very numerous strong amateurs have joined the major Tourney.

We have to rectify the list of probable entries published last week, which now stands as follows:—Steinitz, Zukertort, Mason, Blackburne, Bird, and Skipworth, from England; Mackenzie, from New York; Seilmann, from Baltimore; Winawer, from Warsaw; Tschigoryn, from St. Petersburg; English, from Vienna; Rosenthal, from Paris; and Dr. Woa, from Hungary. It is, perhaps, probable that one more name may be added to this list, but we know of only one other player who could claim equality, if not superiority, to some of the names in this list—we mean L. Paulsen; we shall be very pleased if he should join in the noble contest at the last moment.

The minor Tournament has, as we anticipated, found great favour in the eyes of the Chess community. Twenty-seven players have entered, and this figure may not quite represent the final number of players. There will be several first-class players, both English and foreign, amongst the competitors. The honorary secretary, Mr. Minchin, will likewise take part in this Tournament, and we can only wish him a well-deserved success.

All the foreign competitors have arrived, and some of them have engaged in off-hand games with English amateurs. Mr. Donnesthorpe has been successful against Sellmann, while Mr. Mortimer drew a well-contested Muzio gambit against the redoubtable Winawer, but lost to Tschigoryn. We had also the good fortune to encounter two of the players over the board. In a game with Sellmann, we opened with the Vienna opening. He accepted the gambit, and after 4. Kt to KB3 defended with B to K2, a defence we do not like at all. The game proved very interesting, and was won by us in in 46 moves. We give a position in the middle of the game, after Black's 24th move. We also played two games with Tschigoryn, winning the first and losing the second. We give the first game. The second game Tschigoryn proffered the gambit, which we declined by 2. P to Q4. The game was well contested, but by superior play Tschigoryn won a pawn, and, conducting the ending in a very steady manner, he won. Sellmann also engaged Tschigoryn, each man winning one game. English played some off-hand games at the St. George's Club, in which he was victorious. He will prove himself to be a very strong and tenacious antagonist.

Next week we hope to present our readers with the first specimens of skill by these great masters.

Tuesday Night.—We hear that Mr. James Mortimer, a strong English amateur has joined the major tournament, which, therefore, now contains fourteen players.

ANSWERS TO CORRESPONDENTS.

Clarence.—Problem received, with thanks.

Stettin.—You must always note each colour of pieces from their own side of the board.

B. Davis (Banaras).—We think our plan simpler.

Correct solutions received:—Problem 82, Stettin, Planck. No. 83, Planck. No. 84, H. Planck, Mechanics' Institute, E. E. W., Berrow, Stettin. No. 85, G. W. Thompson, Clarence, W.

S. Gordon, H. A. B., George Robson, J. Barber, Charles E. Bell, solutions incorrect.